A Review on Biodiesel and its Blends

Namdev Gavde, Nawal Gandhi,
Department of Mechanical Engineering
SKN Sinhgad Institute of Technology and Sciences
Lonavala, Maharashtra, India

Dr. Ashokkumar Vangire
Department of Mechanical Engineering
Shetty Institute of Technology
Gulbarga, Karnataka, India

Abstract—The study and examination on substitute fuels for compression ignition engine has become essential. It is because of reduction of petroleum products and its chief role for pollutants. Apart from that vegetable oil can be used as finest substitute fuel. Vegetable oils source are able to decrease carbon dioxide emissions to the atmospheric air, still there is drawback of high viscosity of vegetable oil, which measures higher than that of organic diesel used regularly. The result after use of complete vegetable oil does not shows improved performance. In this review paper study of various properties of methyl ester kusum oil and its blends with diesel is equated and compared with diesel and several vegetable oils. Several parameters such as blending proportion, fuel viscosity, fuel intake temperatures and several loading conditions are vital to be examined for superior engine performance with lower emission values.

Keywords - *CI Engine, Kusum oil, Vegetable oil, Biodiesel blends, Alternative Fuel.*

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I. INTRODUCTION

The compression ignition engines are powerful device so theylead the field of commercial transport and agricultural equipment. They are having comfort of operation withlower fuel consumption. Due to the shortage of petroleum products in coming days and its rising cost, efforts are taking place to develop substitute forcombustible fuels. It has been found that the vegetable oils are capable for replacement of fuels because their properties and characteristics are comparable to that of diesel fuel.Biodiesel can be formed effortlessly and renewably from the vegetables and crops. In many developed countries, biodiesel is produced from rapeseed, sunflower,soybeanetc., all these are edible in Indian environment also. Between the dissimilar vegetable oil sources, non-edible oils are suitable for biodiesel production,since edible oils are formerly in demand and toocostly than diesel fuel. Among the non-edible oil sourcesnahar, mahua, jatropha,neems,kusum, sal, rice bran,karanjanand tumba is recognised as probable biodiesel source and relating with other resources, which has added profits as better seed productivity, quickgrowing [1].

Biodiesel is a chemically enhanced alternative fuel for use in CI engines, follow-on from vegetable oils and animal fats. Biodiesel is made commercially by the process of transesterification of vegetable oils over and done with alcohol. Methanol or else ethanol is the typically used alcohols for this preparation.These can similarly be formed by the biomass sources. The direct use of alcohols as fuel motives corrosion of various parts of the engine.

The transesterificationway solves this problem. The carbon cycle of vegetable oils comprises of absorption and dischargeof carbon dioxide. The combustion and inhalation process releases carbon dioxide and crops for their photosynthesis process involve the carbon dioxide. Thus, the addition of carbon dioxide in atmosphere air decreases. The carbon cycle time for fixation of CO_2 and its release after burning of biodiesel is fairlysmalleras related to the carbon cycle time of petroleum oils.

The experimental outcomes of some researchers providing the use of biodiesel as a possible alternative to the diesel oil for usage in the internal combustion engines. It is equally vital to note that greatest of the trials conducted on biodiesel are mostly obtained from larger edible type oils only. The value of superior oils such as soybean oil,sunflower and palm oil are great as likened to that of diesel. This increases the complete manufactureprice of the biodiesel as well. Biodiesel manufacture from refined oils would not be possible as well as low-cost for the developing countries like India. Hence, it is greater inuse the non-edible type of oils for biodiesel manufacture. In Indian country non-edible type oil yielding trees such as neem, castor, rubber, linseed, karajan, jatropha andkusum are available in large number. The operation of this biodiesel as fuels in internal combustion engines are not justreducing the petroleum procedure, but also improve the rural budget. Fights will be comprehensive here to produce biodiesel from usual unrefined oil (kusum seed oil) and to use it as the fuel in CI engines [1].

Mobilization of financial development produces a thrustingpressure on petroleum grounded fossil fuel. But thepollutant released from this fossil fuel is critical and damaging for environment and accountable for global warming. Thus toreduce environmental danger and guarantee the energy stock, improvement of alternative energy sources which arerenewable and eco-friendlyapproachable has strained the optimistic attention in various republics. In this condition,biodiesel can appear as noticeable alternative to fossil fuel for its renewability, biodegradability, non-toxicity andcarbon neutrality [2].

But the extracreation of biodiesel from agricultural crop has acontrary effect on soilfertility in count to food security. Permittingtotally these factors considerable attention should be paid on particularly ligno-cellulosic biomass similar to willow, non-food crops or agriculturalwaste, switch-grass or woody oil plants. Amongst allthese cultivates Jatropha curcas is found as a likelyresource of biodiesel. At the present-dayuncountableinvestigations have overon jatropha, curcasusing it as unspoiled feedstock of biodiesel production for its toughflexibility to theenvironment, especially in terms of high survival rate, drought oppositionand high seed harvest.The main features of Jatropha have emphasized and equated its properties with some main first groupbio fuel crop such as palm oil,soybean oiland canola oil [3].

II. Overview of Jatropha as biodiesel

Biodiesel is a fuel prepared by mono-alkyl-esters of extended chain fatty acids, follow-on from vegetable oils. The goodquality and sustainability of the biodiesel source to be used largely breakon agreement with the mandatory fuel specifications for diesel engine application, environmental influence, amount, accessibility etc. [4]. In this section, various physical assets, chemical assets, biological assets and environmental aspect of Jatropha oil are debated. Then relate these properties to palm oil, canola oil, soybean oil.

A. Physical and Chemical Properties

The calorific value, kinematic viscosity and flash point are appropriate andsignificant feature of fuel classification. Now different properties for Jatropha oil are debated as follows. Primarily, kinematic viscosity is asignificant characteristic of fuel which effects the quality and efficiency of burning. The kinematic viscosity of Jatropha oil is significantlyadvanced than normal diesel fuel. At about 20 ºC the kinematic viscosity of Jatropha oil is 47.3 [6].It is approximately twelve times greater than normal diesel. The larger calorific value of fuel drops the specific fuel consumption [7]. Many researchers carried out their investigation and found that the calorific value of Jatropha oil, which varies from 38-42.5 MJ/kg. It is slightlysmaller than regular diesel fuel. But it matters greatwith oxygen which profits in whole combustion and surges the combustion competence of biodiesel than that of diesel [8-9].

These properties of Jatropha oil can be improved by numerousprocedures such as micro emulsion,weakening and transesterification. Thus make it comparable to fuel diesel. In the mid of these transesterification is the greatest practical process for biodiesel production.

Table 1: Properties of various biodiesels

Property	Diesel	Palm Oil	Jatropha Oil	Soyabean Oil
Kinematic Viscosity (at 20°C)	3.92	119.99	47.2	63.82-67.48
Calorific Value (MJ/kg)	44.215	41.3	37.83	39.48
Flash Point (°C)	76	>320	210-240	>324

B. Biological property

The source of feed stocks turns out to be manageable when it is cost effective. The cost effectiveness of feed stock rest onnumerousaspects such as space of production, seed harvest,development period and raw oil harvest during various phases of bio-diesel production, abstraction etc. Designated biological properties (both merits and demerits) of Jatropha plant have reflected. Jatropha is stretchy in equally tropical and non-tropical weather with agriculture limits at 30ºN (north)as well as 35ºS (south). It likewise grows in poorer altitudes of 0-500 meter's upstairs sea level. Now it has certainty outside its center of derivation. It has developed on eroded lands, unproductive, under severe climatic situations. However, the soil should be carefully drained as it cannot tolerate standing water and having ph 6~8.5.It can also be grown and established in soil with high ph as 8.5~9.5 by using some unusual practices. It is suitable with average temperature of 20~28ºC in moistures but will be died in dangerous and nonstop frost situations [8].

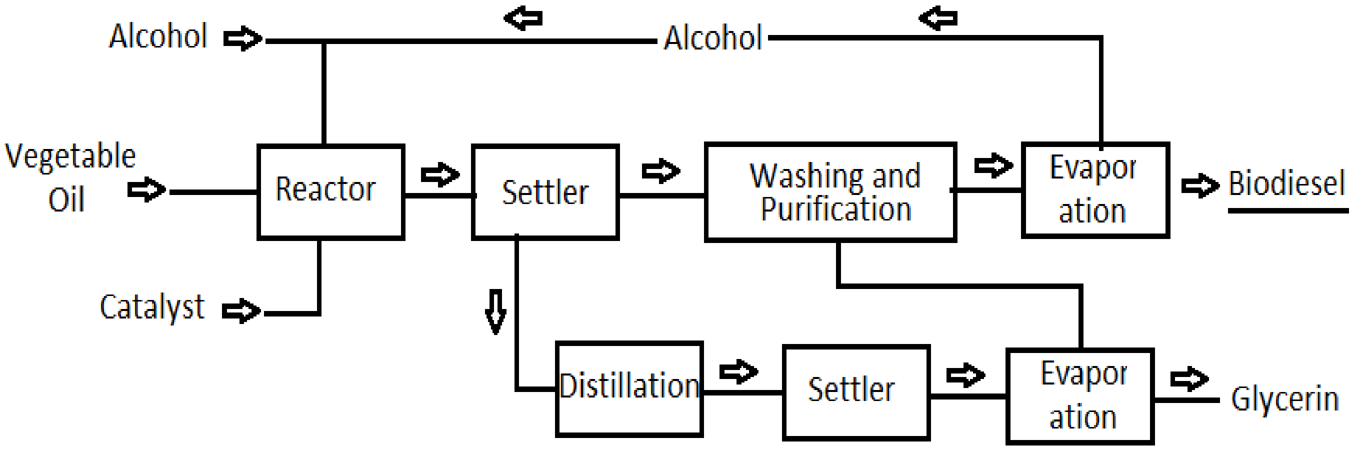

Fig.1 Flowchart of the process of trans-esterification to create biodiesel fuel [9]

III. Conclusion

By concentrated on the relative study of the studied paper for the performance and emissions from severalbiodiesels, it is found that the vegetable oil represents a decent alternative fuel for diesel.Thusit essentially be taken into consideration in the futuristic fuel for transportation purpose. Thus a many conclusions are drawn from the evaluation of various investigational outcomes. Thermal efficiency, exhaust temperature rises although the fact that other performance parameter like BSFC is reduced for warmed vegetable oil fuelled engine related to unheated vegetable oil. Not includingNO_X the further emission features such as CO, HC and CO_2 are reduced due to preheating of the Biodiesel fuel. Preheating by exhaust gases may becomeprobableway out to overcome the trouble of high viscosity of the Biodiesel fuel. The straight vegetable oils have the possible potential to reductionNO_X emissions which is one of the principal alarms of the world nowadays. Thus straight vegetables and their mixturesmotorized engines have anextreme capability to be as good as to that of diesel fuel. It can be full-grown up in degraded farming soil with small care. Furthermore, its ordinary yield rate is about 3 tons. For better yield rate, it needs extra supply of nutrition and water.However, it grips toxic phabol ester but the biodiesel is open from it. It has decent carbon sink capability and drops the CO_2 emission.

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